DOCUMENT RESUME

ED 069 538 SE 015 355

TITLE	Measurement, Grades 4-6.
INSTITUTION	Halton County Board of Education, Burlington (Ontario).
PUB DATE	[72]
NOTE	48p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	Activity Learning; Curriculum; *Elementary School Mathematics; *Geometric Concepts; Instruction; *Instructional Materials; Intermediate Grades; Laboratory Procedures; Mathematics Education; *Measurement; Worksheets

ABSTRACT

This is a collection of mathematics laboratory activities related to the topics of linear and square measure. There are a number of experimental situations from which results may be generalized. Also included are worksheets, examples and discussion questions which are based on practical situations whenever possible. The materials are for student use and contain no comments for teachers. (LS)

Yr 4-6

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MEASUREMENT

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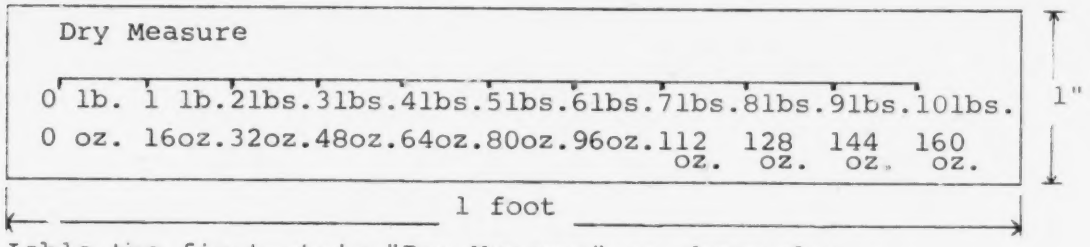
SE 015 355

1. Cut out strips of bristle board 1 foot long and 1 inch wide.


Dry Measure
0 lb. 1 lb. 2 lbs. 3 lbs. 4 lbs. 5 lbs. 6 lbs. 7 lbs. 8 lbs. 9 lbs. 10 lbs.
0 oz. 16 oz. 32 oz. 48 oz. 64 oz. 80 oz. 96 oz. 112 oz. 128 oz. 144 oz. 160 oz.
1"
1 foot

2. Lable the first strip "Dry Measure" as shown above.
3. Draw in a 10" line with a straight edge and divide the line into 10 equal segments.
4. Write the conversion units on the number line as shown above.
5. Make similar "conversion strips" for:
   (a) Liquid Measure,
   (b) Time,
   (c) Area,
   (d) Cooking Measure,
   (e) Metric Units.

Lengths measured with a ruler are not exact. However, we may indicate how exact our measurements are by stating how accurate the measurement was. For example if we were told the length of a room was 20 ft., it would be perfectly reasonable to assume that the actual length of the room was anywhere between 19½ ft. and 20½ ft. But, if carpeting cost $20.00 per foot, we would want a more accurate measure if we wanted to carpet the room.

(i) Referring to an ordinary yardstick, which of the following would be a reasonable estimate of the length of the room? (As accurate as possible.)
The length is

(a) between 19¼ ft. and 20 3/4 ft.
(b) between 19 3/8 ft. and 20 5/8 ft.
(c) between 19 ft. 11 in. and 20 ft. 1 in.
(d) between 19 ft. 11 7/8 in. and 20 ft. 1/8 in.
(e) between 19 ft. 11 3/4 in. and 20 ft. 1/4 in.
(f) between 19 16/17 ft. and 20 1/17 ft.
(g) between 19.999 ft. and 20.001 ft.

(ii) Which of the above measurements would be impossible using an ordinary yardstick?

(iii) Measure the perimeter of your desk. Indicate how accurately you measured the perimeter of your desk.

(iv) Measure the perimeter of your classroom. Indicate how accurate your measure was.

1. Make a floor plan of the living room, dining room and kitchen of your home. Use the scale 1/2" = 1 foot.
2. Indicate the accuracy of your measurement.
3. Find the cost of carpeting the living room and dining room.
4. Find the cost of tiling the kitchen.
5. Find the cost of furnishing the three rooms itemizing each room separately.
6. Which room was the most costly to outfit?
7. Find the cost per foot of outfitting the three rooms.
8. What is the ratio of costs - dining room to kitchen, kitchen to living room, living room to dining room.

1. Get a road map.
2. Trace out a route to a favorite vacation area.
3. Use the scale factor given on the map to calculate the distance from your school to the vacation area.
4. How accurate is your measurement?
5. If you average 60 miles per hour on the trip, how long would the trip take?
6. Ask your parent how many miles your car will travel on one gallon of gasoline.
7. Estimate the cost for gasoline for your trip.
8. Draw a straight line from your home to the vacation area and calculate the distance 'as the crow flies'.
9. How much shorter is the direct route?
10. How much time would be saved at 60 miles per hour?
11. How much money would be saved on buying gasoline?

1. Estimate the length of Da Gama's voyage.
2. How long did the voyage take?
3. How many miles did he average in a day?

Boys

Name	Height

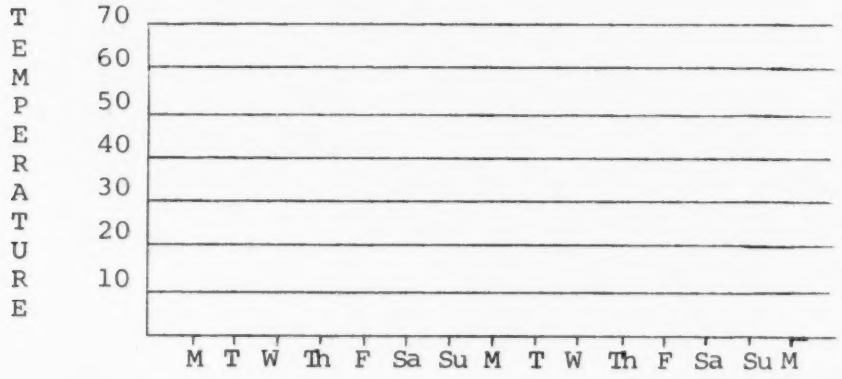
Girls

Name	Height

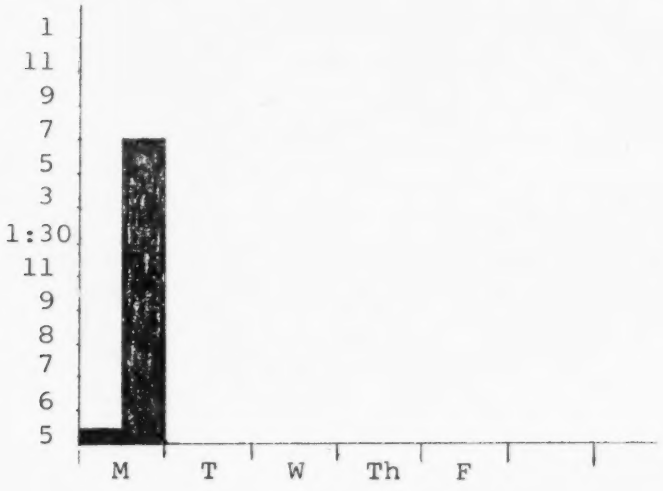
1. Record the heights of each boy and girl in your class in a table as shown above.
2. Which group do you think will tend to be taller?
3. Find which group tends to be taller
   (a) graphically,
   (b) numerically (average)
4. How accurate is your measurement?
5. Compare your results with another Grade 6 class.
6. Do you expect your class to be generally taller or shorter than a Grade 7 class? Estimate how much.

7. Measure the heights of the students in a Grade 7 class and record the heights in a similar table.
8. Compare the results with your estimate.

1. Graph the daily temperature change outside your school at 12:00 noon each day.



1. Graph the daily sunrise and sunset times given by your local weather forecast. Use a bar graph, red for sunrise, blue for sunset.



2. Are the days getting longer. Show this by calculating the daily difference in sunrise and sunset.

3. Show what portions of your graph indicate daylight (sunrise to sunset).

You are to give a graduating party for your class. Estimate the quantity and cost of the following items.
(The items are separated into items the boys would look after and those the girls would look after.)

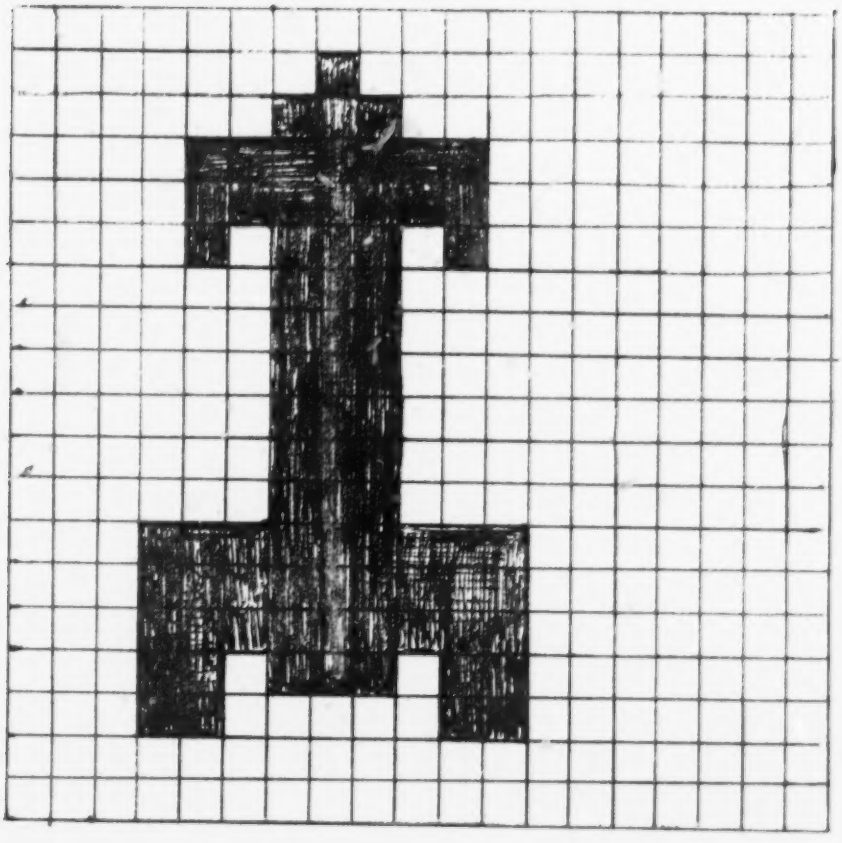
Boys	Girls
Weiners	- Ingredients for chocolate cakes to be baked
Hot dog buns	
Mustard	- Items for relish tray
Relish	- Paper cups
Catsup	- Paper plates
Charcoal, fuel	- Serviettes
Pop	- Decorations
Milk	
Barbeques	
Records	

1. What fraction of the total grid (attached) is the shaded area?
2. Get a clear piece of cellophane with a grid on it similar to the attached piece of graph paper.
3. Using the grid and your atlas, estimate the areas of

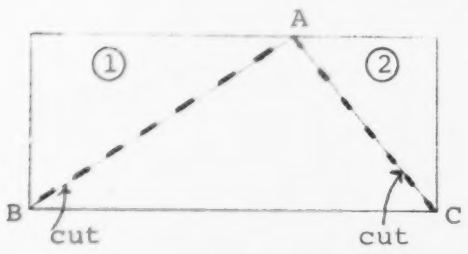
(a) England	(b) Scotland	(c) Canada
(d) U.S.A.	(e) South America	(f) Africa
(g) Russia	(h) China	(i) North America

4. Find the ratios of areas of
   (i) England and Scotland
   (ii) Canada & U.S.A.
   (iii) North America and Russia
   (iv) Russia and China
   (v) British Isles and Canada
   (vi) Africa and South America
5. How accurate are your measurements?

10(b)



1. Get 4 rectangular pieces of paper of different lengths and widths.
2. Draw a triangle in each of the 4 rectangles as shown in the diagram. Have vertex 'A' in different positions along the top edge for each of the 4 rectangles.



3. Now cut along the edges indicated, leaving triangle A B C and the two pieces ① and ② .
4. Fit parts ① and ② to completely cover △ A B C .
5. How does the area of parts ① & ② compare with the area of the triangle A B C in each of the four cases?
6. How does the area of the triangle compare with the area of the rectangle in each case?

Measurement

1. Find the area of the rectangle in figure 1 (attached).
2. Find the area of the shaded portion in figure 1.
3. How does the area of the triangle in figure 1 compare with the area of the rectangle?
4. What is the area of rectangle ABCD in figure 2 (attached)?
5. What is the area of rectangle ABFE in figure 2?
6. What is the area of triangle BFE?
7. How does the area of △ BFE compare with rectangle ABFE?
8. How does the area of △ EFC compare with rectangle EFCD?
9. How does the area of △ EBC compare with rectangle ABCD?
10. Write a statement that describes the relationship of the area of a triangle with a rectangle that has the same base and height.

11(c)

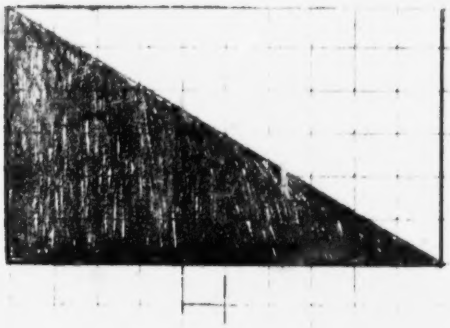


Figure 1

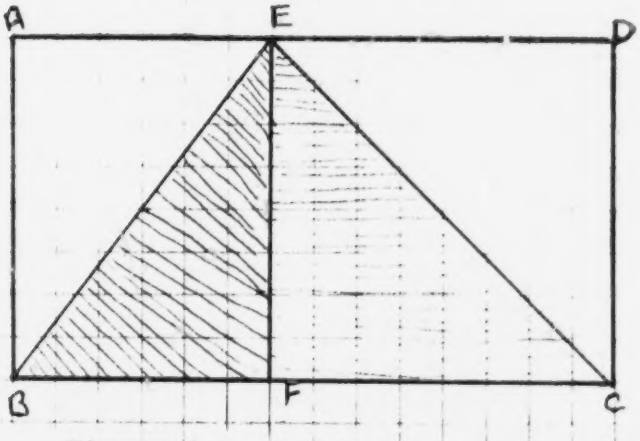


Figure 2

1. Find the area of ABC in figure 1 (attached).
2. Find the area of the quadrilateral XYZQ in figure 2.
3. Find the area of the pentagon MNRST in figure 3.

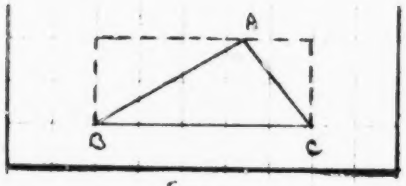


Fig. 1

Fig 1

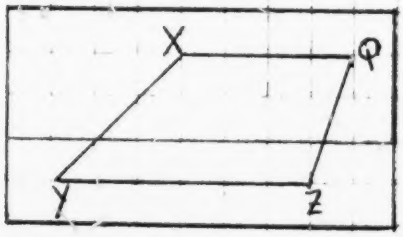


Fig. 2

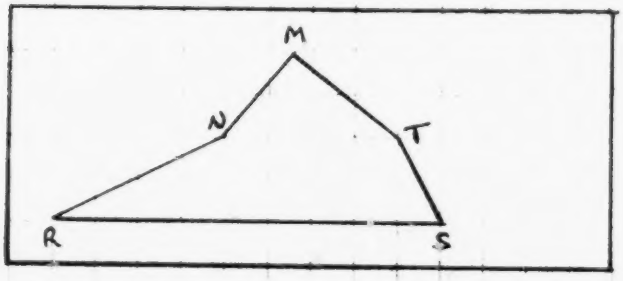
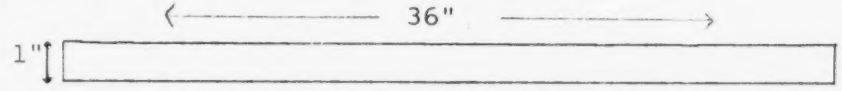


fig.3

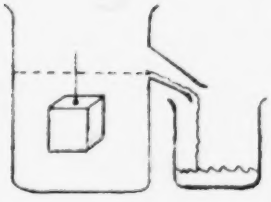
Use a set of 36 1 inch squares and use them to make all possible rectangles 36 square inches in area.

For example, one rectangle would be 36" by 1".



1. Write down the set of ordered pairs (width, length)
   {(1,36), (2, 18) ...}
2. How many members does the set have?
3. Graph this set of ordered pairs and join the points.
4. What did you discover regarding this line?
5. For each of the rectangles, find the perimeter and write the set of ordered pairs (area, perimeter) as follows:
   {(36, 74), (36, 40) ...}
6. What is the shape of the rectangle for which the perimeter is smallest.

Equipment needed
- overflow can
- 5 rectangular solids
- pin



1. Calculate the volume of each rectangular solid using metric measure.
2. Immerse the solids - (if the solid floats, stick a pin in it and immerse it) - and catch the overflow.
3. Note the volume of water caught in the beaker.

Volume of Solid	Volume of Displaced Water
1	
2	
3	
4	

4. How does the volume of the solid compare with the volume of the water displaced?

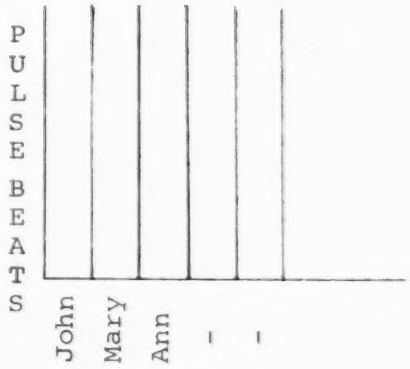
5. Find the volume of a marble.

6. Find the volume of five other irregular solids.

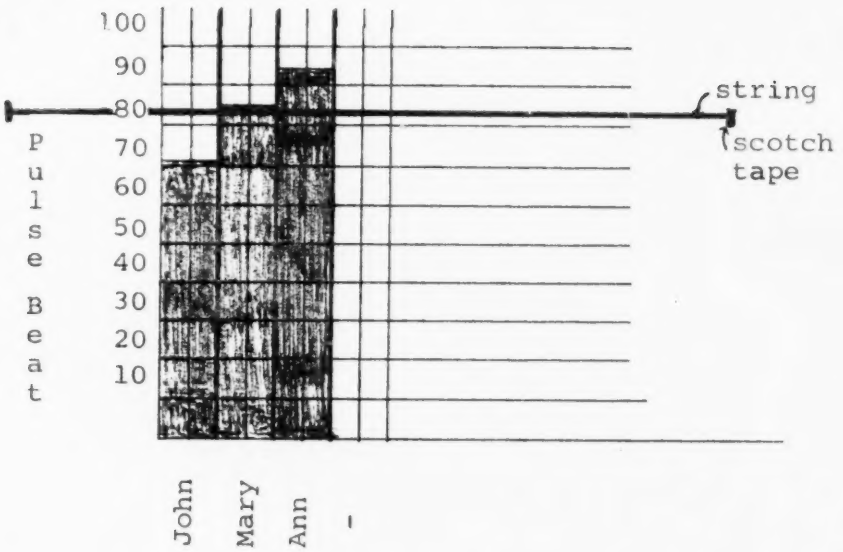
How fast does your heart beat?
You need a stopwatch and a wrist.

Make a chart as follows:

NAME	Number of Heart Beats in One Minute
John	66
Mary	80
Ann	90
-	-
-	-



Count the number of pulse beats in one minute, of ten of your classmates, and record the result in your table.
Make a bar graph to show the various pulse rates.



With scotch tape, fasten a piece of string to your desk so that your graph can slide underneath it.

Slide your diagram up or down so that the number of shaded squares above the string equals the number of unshaded squares below the string.

(i) What number on the left of the scale (pulse beat) does the string pass over in your diagram.

(ii) Find the average pulse beat. Compare this value with (i).

Pendulum

You will need some string and plasticine. You will also need a stopwatch.
Roll some of the plasticine into a ball.
Cut off five or six feet of string.
Tie one end to a nail and imbed the nail into the ball of plasticine.
Make sure it is quite secure.
Hang the string and ball of plasticine by a hook.

You have a pendulum.

Swing your pendulum, being careful that it swings freely. Count the number of times it goes from one side to the other in one minute.
Remove some plasticine to make a smaller ball. Swing the pendulum again. Count the number of times it goes from one side to the other in one minute.

Add some plasticine to make the ball larger than the first one.

Pendulum

Again swing the pendulum and count the number of times it goes it goes from one side to the other in one minute.

Did you notice any difference in the number of swings? Make the following table.

Length of string	Number of swings in one minute
6 feet	
5 feet	
4 feet	
3 feet	
2 feet	
1 foot	

Pendulum

Make the pendulum 6 feet long. Count the number of swings in one minute. Enter the results in your table. Now make the string one foot shorter and do the same thing again. Repeat this until you have completed your table.

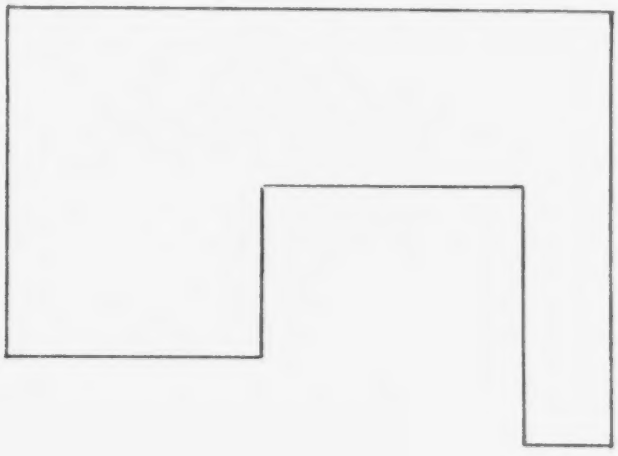
If you wanted to increase the number of swings from one side to the other in one minute, would you

(a) lengthen the string?
(b) remove some plasticine from the ball to make it smaller?
(c) shorten the string?

Measurement

Find the measure of the distance around the shape shown below using the unit of measurement given. Also, find the area using the square unit of measurement given.

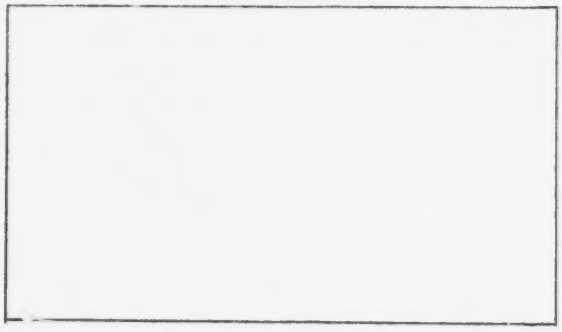
Unit



Measurement

Unit of Square Measure

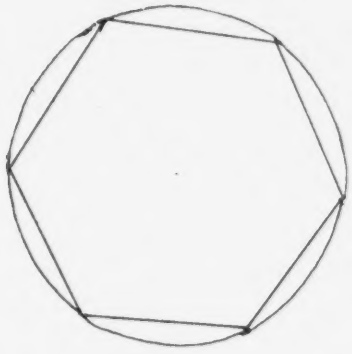
SHAPE



Use the square unit of measurement to find a method to obtain the area of the shape above.

Measurement

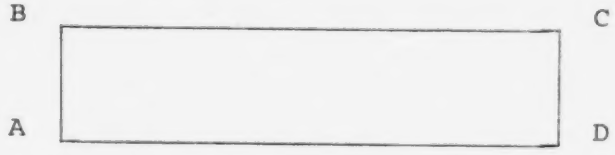
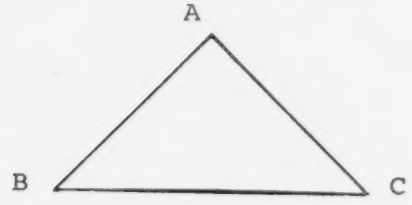
1. Measure the length of the sides of the hexagon and the radius of the circle.



What did you discover? Will this help you to construct a hexagon? (Construct one)

Measurement

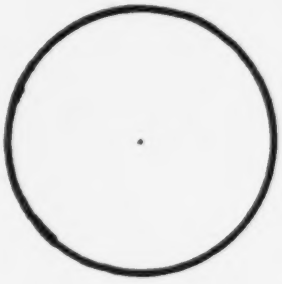
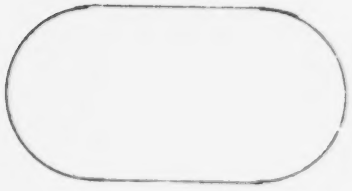
Count the number of times the unit is contained in each shape to be measured.

Unit	Shape to be measured	Measure
⌊——⌋		
⌊——⌋		

How would you compare the measure of the distance around each shape?

Measurement

Count the number of times the unit is contained in each of the following shapes.

Unit	Shape to be measured	Measure
⌊_____⌋		_____
⌊___⌋		_____

How would you compare the measure of the distance around each shape?

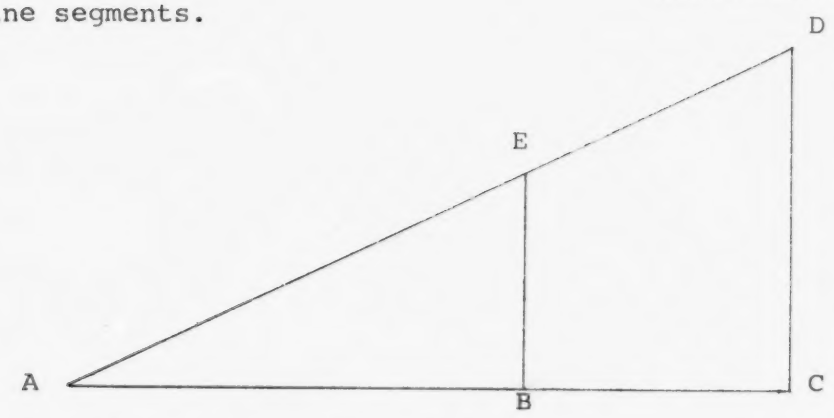
Measurement

Measure the line segments.

AC =
CD =

AB =
BE =

AD =
AE =



1. Find the ratios $\frac{AC}{CD}$, $\frac{AB}{BE}$, $\frac{AC}{AD}$, $\frac{AB}{AE}$

What did you discover?

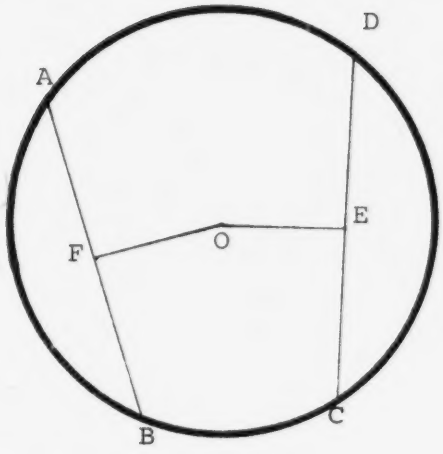
Measure the line segments.

AB =

CD =

OE =

OF =



Summarize your finding.

Use a piece of string 36 inches long to lay out a triangle with three equal sides.
Measure the angles and record them as follows:

ANGLE	MEASURE IN DEGREES
1	
2	
3	
SUM	

1. What are your conclusions regarding -
   a) Size of three angles?
   b) Sum of the angles?

Measurement

You are provided with a loop of string 36" long. Make rectangles of different dimensions with it, starting with a rectangle of width 1" and length 17".

Record your information as follows:

Length x (in inches)	Width y (in inches)	Area A (in sq. inches)
1	17	17
2	16	32
.	.	.
.	.	.
.	.	.

1. Draw a graph of the relationship between lengths and area.
2. Calculate the length and area of rectangles with width $17\frac{1}{2}$ inches, $3\frac{1}{4}$ inches, 1/4 inches and plot these points on the graph.
3. Complete the graph for all length from 0 to 18.
4. Which rectangle has the greatest area?

Measure the diameter and circumference of a set of food cans of various sizes and construct the following record of your measurements.

Can	Diameter	Circumference	Circumference ÷ Diameter
1			
2			
3			
4			
5			

Write a brief paragraph on the relationship you have discovered.

Measurement

Using inch square graph paper, cut out a set of squares of dimension

(1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12)

and complete the following table:

Measure of Square	Perimeter of Square	Area sq. units
1	4	1
2	8	4
3	.	.
4	.	.
5	.	.
.	.	.
.	.	.

1. Write the measure and perimeter as a set of ordered pairs as follows (measure, perimeter) $\{(1,4), (2,8) \ldots\}$
2. Graph this set of ordered pairs; what did you discover?
3. Write the measure and area as a set of ordered pairs. $\{(1,1) \quad (2,4) \quad (3,9) \ldots\}$
4. Graph this set of ordered pairs; what did you discover?

A. TAKE 50 COUNTING BLOCKS, AND BUILD

1. A BLOCK 4 UNITS LONG, 3 UNITS WIDE AND 2 UNITS HIGH.

B. MAKE A RECORD IN YOUR NOTEBOOK, e.g.

Length	Width	Height	No. of Units
4"	3"	2"	?

C. MAKE FIVE MORE DIFFERENT BLOCKS.

D. MAKE A NEAT RECORD OF ALL THESE BLOCKS IN YOUR NOTEBOOK.

USING THE CLINOMETER FIND THE HEIGHT OF THE FLAGPOLE OF THE SCHOOL.

IN YOUR NOTEBOOK, SHOW

1. HOW YOU MEASURED THE HEIGHT.

2. YOUR CALCULATIONS YOU USED TO CALCULATE THE HEIGHT.

AREA - UNITS OF MEASURE

FROM A SHEET OF CONSTRUCTION PAPER, MAKE A SQUARE 12" x 12" AND ANOTHER 1" x 1". WHAT ARE EACH OF THESE CALLED? HOW MANY OF THE SMALLER SQUARES WILL FIT IN THE LARGER SQUARE?

CONSTRUCT ANOTHER SQUARE, ONE YARD - TO A SIDE ON THE BLACKBOARD. HOW MANY OF THE ONE FOOT SQUARES WILL YOU NEED TO FILL IT?

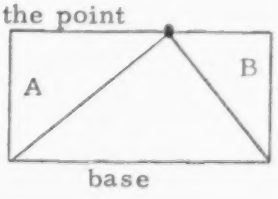
WRITE A NOTE IN YOUR MATH. WORKBOOK IN THE FORM OF A TABLE -

GEOMETRY: AREA OF A TRIANGLE. METHOD I.

1. CUT A RECTANGLE FROM A SHEET OF CONSTRUCTION PAPER. CALCULATE ITS SIDES.

2. CALL ANY SIDE THE BASE. ON THE OPPOSITE SIDE SELECT ANY POINT AND DRAW LINE CONNECTING THE POINT WITH THE BASE:

EXAMPLE:



3. ESTIMATE THE AREA OF THE TRIANGLE IN SQUARE INCHES.

4. CUT THE TRIANGLE OUT. REARRANGE PIECES "A" AND "B", TO SEE HOW MUCH OF TRIANGLE CAN BE COVERED BY THEM.

5. WHAT IS THE AREA OF THE TRIANGLE? WHAT FRACTION OF THE RECTANGLE IS THIS AREA? COMPARE WITH YOUR ESTIMATE.

6. WILL THIS WORK FOR ANY TRIANGLE? WHY ?

7. IN <u>YOUR</u> NOTEBOOK, DRAW A DIAGRAM TO ILLUSTRATE YOUR METHOD. WRITE YOUR CONCLUSIONS IN A FEW SENTENCES. ANSWER QUESTION #6, GIVING REASONS. STATE A METHOD FOR FINDING THE AREA OF <u>ANY</u> TRIANGLE.

MEASURE THE HEIGHT OF THE GOAL POSTS.

MEASURE THE DISTANCE BETWEEN THE TWO POSTS.

CALCULATE THE AREA OF THE GOAL RECTANGLE.

FIND TWO OTHER RECTANGLES OUTSIDE.

MEASURE THEM AND CALCULATE THE AREA.

IN YOUR NOTEBOOK - DRAW SKETCHES OF YOUR RECTANGLES AND SHOW YOUR CALCULATIONS OF THE AREAS.

A. MEASURE THE HEIGHT OF EACH PERSON IN YOUR GROUP, AS WELL AS OF EACH PERSON IN THE OTHER GROUP DOING THE SAME PROJECT. USE A YARDSTICK.

B. TAKE A SHEET OF GRAPH PAPER AND A MAGIC MARKER, AND MAKE A GRAPH TO SHOW YOUR RESULTS.

C. IN YOUR NOTEBOOK, WRITE A SHORT NOTE ABOUT HOW TO MAKE A GRAPH.

A. TAKE A DOUBLE HANDFUL OF 1" SQUARES AND MAKE THE FOLLOWING RECTANGLES:

1. 8" LONG AND 6" WIDE
2. 5" LONG AND 3" WIDE
3. 10" LONG AND 8" WIDE
4, 5, 6. THREE MORE OF YOUR CHOICE.

B. MAKE A RECORD IN YOUR NOTEBOOK ABOUT EACH RECTANGLE:

Length	Width	Distance around edge	No. of paper squares used
8"	6"		

A. TAKE 50 COUNTING BLOCKS, AND BUILD

1. A BLOCK 4 UNITS LONG, 3 UNITS WIDE AND 2 UNITS HIGH.

B. MAKE A RECORD IN YOUR NOTEBOOK, e.g.

Length	Width	Height	No. of Units
4"	3"	2"	?

C. MAKE FIVE MORE DIFFERENT BLOCKS.

D. MAKE A NEAT RECORD OF ALL THESE BLOCKS IN YOUR NOTEBOOK.

USING THE CLINOMETER OR SOME OTHER METHOD, FIND THE HEIGHT OF THE FLAGPOLE OF THE SCHOOL.

IN YOUR NOTEBOOK, SHOW

1. HOW YOU MEASURED THE HEIGHT.

2. YOUR CALCULATIONS YOU USED TO CALCULATE THE HEIGHT.

GEOMETRY: CIRCUMFERENCE OF A CIRCLE

1. MEASURE THE DIAMETER AND THE CIRCUMFERENCE OF:

   a) A BICYCLE WHEEL

   b) A TRUNDLE WHEEL'S WHEEL

   c) A JAR TOP.

2. DIVIDE THE CIRCUMFERENCE BY THE DIAMETER.

3. DO YOU FIND A PATTERN? IF SO, WHAT IS THE PATTERN?

4. <u>RESEARCH:</u> FIND OUT MORE ABOUT THE DIAMETER AND THE CIRCUMFERENCE OF A CIRCLE BY USING THE RESEARCH METHOD.

   SUGGESTED INDEX TITLES:

   CIRCLE CIRCUMFERENCE
   DIAMETER

   IN <u>YOUR</u> NOTEBOOK, ETC.